Code: 15A56101 **R15**

B.Tech I Year II Semester (R15) Regular Examinations May/June 2016

ENGINEERING PHYSICS

(Common to IT, ECE, EIE and ME)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

Note: Physical constants: Planck's constant: $h = 6.626 \times 10^{-34}$ J s,

Boltzmann's constant k= $1.38 \times 10^{-23} JK^{-1}$

Mass of the electron $m_e = 9.1 \times 10^{-31}$ kg, Charge of the electron $e = 1.6 \times 10^{-19}$C

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Draw the intensity distribution curve for interference and diffraction and mention the condition for constructive interference.

(b) Mention the significance of metastable state and optical resonant cavity in the laser system.

(c) Draw the following in the unit cell: (1 $\bar{2}$ 1), [1 0 1]

(d) Find the maximum wavelength of X-rays diffracted by a crystal of interplanar spacing $4A^o$.

(e) List out any four properties of ultrasonic waves.

(f) What are the assumptions of quantum free electron theory?

(g) Draw the nature of a wave function of particle in a potential well at ground and first excited states.

(h) Based on any two properties compare para and dia magnetic materials.

(i) Interpret the effect of temperature on normal conductor and super conductor graphically.

(j) How does top-down approach is differ from bottom-up approach?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) State the principle and explain the working of semiconductor laser with neat energy band diagram.

(b) A relative population of (1/e) is often considered in two energy state at 20^oC. Determine the wavelength of the radiation at that temperature.

OR

3 (a) Obtain an expression for numerical aperture in terms of the refractive indices of core and cladding. Mention any two advantages and disadvantages of optical communication over the conventional.

(b) A fiber with an input power of 9×10^{-6} W has a loss of 1.5 dB/Km. If the fiber is 3 km long, what is the output power?

UNIT – II

4 (a) Show that the atomic packing fraction of FCC is greater than BCC.

(b) Monochromatic x-rays of wavelength $0.82A^o$ undergo first order Bragg reflection from a crystal of cubic lattice constant $3A^o$, at a glancing angle 7.85^o. Indentify the possible planes which give rise to this reflection.

OR

5 (a) What are ultrasonic waves? Describe the ultrasonic non-destructing method used for flaw detection.

(b) Deduce the Miller indices of a plane with intercepts a/2, 3b/4 along X and Y axes and is parallel to Z-axis, where a and b are primitive vectors.

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UNIT – III

6 (a) Setup time independent Schrodinger wave equation for a particle in motion.
(b) Calculate de-Broglie wavelength associated with: (i) A cricket ball of 300g. (ii) An electron both are moving with the speed of 220 km/hour. Interpret the result.

OR

7 (a) Explain the formation of energy band due to the interaction of atoms in silicon.
(b) Calculate the probability of the electrons occupying an energy level 0.02eV above the Fermi level at 200 K in a metal.

UNIT – IV

8 (a) Based on hysteresis loop, distinguish soft and hard magnetic materials and mention their applications.
(b) Define Bohr Magneton. Find its value.

OR

9 (a) Derive an expression for drift current and diffusion current density for electrons and holes and hence, find the total current density.
(b) What is Hall effect? Mention its application.

UNIT – V

10 (a) What are cooper pairs? Explain how Cooper pairs increase the conductivity of superconductor.
(b) Define Meissner effect. Explain type-II superconductor.

OR

11 (a) What are nanomaterials? Mention the applications of nanomaterials. Why the properties of materials change at nano scale.
(b) Explain the synthesis of nanomaterials by sol gel method.

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